Claims

1. A hydrogel comprising a network of hydrophilic polymers having hydroxyl group carrying carbon to carbon backbones having a tensile strength of at least 1 MPa.

2. A hydrogel according to claim 1 having an elasticity modulus less than about 10 kPa, preferably less than about 5 kPa.

3. A hydrogel according to claim 1 having a tensile strength of at least about 5 MPa.

4. A hydrogel according to claim 1 having an elongation of at least 50% at equilibrium water content.

5. A hydrogel according to claim 1 having sufficient optical clarity so as to obtain an optical transmission of at least about 40%.

6. A hydrogel according to claim 1 having a refractive index of at least about 1.40.

7. A hydrogel according to claim 1, wherein the hydrophilic polymers have a molecular weight of at least 200 000, preferably at least 300 000.

8. A hydrogel according to claim 1 having a polymer content between about 30 to 80% (wt), preferably between about 40 to 70% (wt).

9. A hydrogel according to claim 1, wherein the hydrophilic polymer is chemically modified with agent capable of reducing its equilibrium water content.

10. A hydrogel according to claim 9, wherein said agent is a monoisocyanate.

11. A hydrogel according to claim 10, wherein said monoisocyanate is a lower alkyl, aryl or arylalkyl isocyanate.

12. A hydrogel according to claim 1 wherein the hydrophilic polymer is selected from at least one of the polymers $-(CH_2-CHOH)_n-$ (polyvinyl alcohol); $-(CH_2-CH_2)_n(CH_2-CHOH)_m-$ (copolymer of ethylene and vinyl alcohol); $-(CH_2-CH_2-CHOH)_n-$ (poly(1--hydroxy-1,3-propanediyl) and $-(CH_2-CH(CH_2OH))_n-$ (polyallyl alcohol).

13. A hydrogel according to claim 12, wherein the hydrophilic polymer is polyallyl alcohol.

14. A hydrogel according to claim 1, wherein the network is formed by crosslinks between the hydrophilic polymers.

15. A hydrogel according to claim 14, wherein the crosslinking density is less than about 10%, preferably less than about 5%.

16. A hydrogel according to claim 15 crosslinked by means of a diisocyanate.

17. A hydrogel according to claim 16, wherein said diisocyanate has a formula OCN-$(CH_2)_4$-NH-C(O)O-$(CH_2)_4$-O(O)C-NH-$(CH_2)_4$-NCO.

18. A hydrogel according to claim 16 having crosslinks of the formula –O-C(O)-NH-R-NH-C(O)-O-, wherein R is a spacing group.

19. A hydrogel according to claim 9, wherein R is an optionally substituted lower alkyl group having between one and ten carbon atoms.

20. A hydrogel according to claim 19, wherein R is –$(CH_2)_4$-

21. A hydrogel according to claim 14 crosslinked by means of an epoxy compound.

22. A hydrogel according to claim 12, wherein the hydrophilic polymer poly(1-hydroxy-1,3-propanediyl.

23. A hydrogel according to claim 22 crosslinked with diisocyanates.

24. A hydrogel comprising poly(1-hydroxy-1,3-propanediyl) crosslinked with a lower alkyl diisocyanate.

25. A hydrogel according to claim 24, wherein said lower alkyl diisocyanate is 1,4-butanediisocyanate.

26. A hydrogel according to claim 24, wherein the hydroxyl groups of poly(1-hydroxy-1,3-propanediyl is modified with a monoiscyanate before being crosslinked with a lower alkyl diisocyanate.

27. An implant made of a hydrogel according to any of claims 1 to 26

28. An ophthalmic lens made of a hydrogel according to any of claims 1 to 24.

29. An ophthalmic lens according to claim 27 having

(a) an elasticity modulus less than about 10kPa, preferably less than about 5kPa;
(b) a tensile strength of at least about 1 MPa;
(c) an elongation of at least 50% at equilibrium water content;
(d) sufficient optical clarity so as to obtain an optical transmission of at least about 40%; and
(e) a refractive index of at least about 1.40.

30. A method of preparing a hydrogel having a low elasticity modulus from a hydrophilic polymer comprising the steps of:

(a) selecting hydrophilic polymer of sufficiently high molecular weight;
(b) dissolving said polymer in a good solvent to a concentration not exceeding about 5 % (wt);
(c) adding a crosslinking agent;
(d) mixing and reacting polymer with crosslinker;
(e) evaporating said solvent;
(f) optionally adding water.

31. A method according to claim 30, wherein the crosslinking agent is a diisocyanate.

32. A method according to claim 30, wherein the hydrophilic polymer has a molecular weight of at least about 200 000, preferably at least about 300 000.

33. A method according to claim 30 further comprising degassing the solution of polymer in good solvent.

34. A method according to claim 30 further comprising the step of chemically modifying the polymer so as to reduce its hydrophilicity.

35. A method according to claim 30, wherein the hydrophilic polymers have hydroxyl group carrying carbon-carbon backbone

36. A method according to claim 35, wherein the hydrophilic polymers are selected from at least one of the polymers $-(CH_2-CHOH)_n-$ (polyvinyl alcohol); $-(CH_2-CH_2)_n(CH_2-CHOH)_m-$ (copolymer of ethylene and vinyl alcohol); $-(CH_2-CH_2-CHOH)_n-$ (poly(1-hydroxy-1,3-propanediyl)) and $-(CH_2-CH(CH_2OH))_n-$ (polyallyl alcohol).

37. A method according to claim 35 characterized by modifying the hydrophilic polymer by reacting it with a mono-isocyanate.

38. A method according to claim 37 characterized by modifying less than 15 %, preferably less than 10 % of their hydroxyl groups.

39. A method according to claim 30 characterized by performing the crosslinking at constant volume.

40. A method according to claim 30 resulting in the formation of a hydrogel having an elasticity modulus less than about 10 kPa, preferably less than about 5 kPa.

41. A method according to claim 36 wherein the hydrophilic polymer is (poly(1-hydroxy-1,3-propanediyl).

42. A method according to claim 41 wherein the crosslinker is a diisocyanate.
